

years old, the huge iron girders at Puri, the iron-roofed temple porch at Kanurac, and other relics which show the ancient familiarity of the Hindus with this metal. In the fourteenth century brass and bell-metal were stated to be alloys, and zinc, copper and tin to be metals. The manufacture of gold jewellery is also of great antiquity in India.

Dr. Rāy has ably carried out his task of proving that the ancient lore of the Hindus was far in advance of that of the rest of the world, China excepted. The reader who is unversed in Sanskrit may perhaps be pardoned if he sometimes loses himself for a moment in the maze of Hindu names, and it will be well if his "discerning faculty is nimble and agile, and can suddenly surround a proposition." A glossary would be useful, but could scarcely add to the interest of the volume. The second volume, promised when Dr. Rāy has examined further manuscripts, will be welcome.

T. K. R.

OUR BOOK SHELF.

The Soil: an Introduction to the Scientific Study of the Growth of Crops. By A. D. Hall, M.A. Pp. xiii + 286. (London: J. Murray, 1903.) Price 3s. 6d.

WHEN one who has been for many years both a teacher and an investigator commits to paper the facts and ideas which have formed the substance of his later courses of instruction, we expect a very useful book, and in the present instance we are certainly not disappointed. The book before us takes a wide scope; it deals with the origin of soils, their physical properties, their chemical properties and composition, methods of analysis, the living organisms within the soil, the causes of fertility and sterility, soil types and the natural flora belonging to each. The book is primarily intended for college students. Owing to its wide scope it does not attempt to treat any part of the subject in an exhaustive manner; it possesses, however, the great merits of originality and suggestiveness, virtues which are not always to be found in the formal text-book. A prominent feature of the work is the introduction of the results of investigations carried on by the author while principal of the Agricultural College at Wye. English books on scientific agriculture have hitherto been so necessarily filled with descriptions of foreign researches that any results obtained under English conditions have an exceptional value, and appeal to the farmer in a special manner.

In a work dealing with so many subjects, there are naturally some points open to criticism. The author seems to hesitate in attributing some of the physical properties of soil constituents to their colloid nature, and thus leaves unexplained the enormous amount of hygroscopic water held by humic matter. The indigo method of determining nitrates is mentioned as one that may be used for determining nitrates in soil extracts; the method is, in fact, unsuitable for this purpose, as it gives results much below the truth owing to the presence of organic matter. Nitrification is occasionally spoken of as a kind of "fermentation"; objection may surely be taken to this description. Fermentation is a word of wide meaning, but it surely should not include the oxidation of inorganic matter by a living organism. The chapter dealing with the power of soils to retain various bases and acids is full of interest, yet the theory is incompletely stated, the results of the German, French, and some English

investigations on the subject being unnoticed. The laws governing the diffusion of salts, and the results of their molecular diffusion in a moist soil, are also not noticed. The cause of the sterility of alkali lands, and their proper treatment, are, however, well discussed, and many excellent illustrations of the subject are introduced from the experience gained in Egypt.

In a book dealing with many details some slips will inevitably occur; the most important one in the present case is that King's determinations of nitrates in fallow soil appear as determinations of nitrogen as nitrates; the quantity of nitrates present is thus unintentionally much exaggerated.

The concluding chapters on fertility and soil types exhibit most fully the thoroughly practical character of the author's teaching, and will be much valued by many readers. The book is sure to meet with a favourable reception.

R. W.

Electrical Problems for Engineering Students. By W. L. Hooper, Ph.D., and R. T. Wells, M.S. Pp. v + 170. (Boston and London: Ginn and Co., 1902.) Price 6s.

THIS is a collection of numerical and mathematical exercises in electrical engineering, starting from the most elementary beginning and ending in the more difficult problems presented by the design and working of direct and alternating current dynamos and motors. The exercises have been tested by the practical experience of the authors at Tuft's College, Mass., and are such as would form a useful accompaniment to a two or three years' lecture and practical course. A distinctly good feature of the book is the number of examples requiring graphical solutions, which cannot fail to impress upon the student the advantages gained by plotting curves. It is always an objection to exercises of this sort that they tend too much to the purely arithmetical and academic side of the subject; thus, many of the problems on subjects which are treated only in an elementary manner in this book are little better than arithmetic sums. For example, in the twelfth chapter, on electrochemistry, there are eleven problems, which are all practically simple proportion sums, and we doubt if the student would gain much more by solving them than he would by solving an equal number of problems on, say, the number of able-bodied men and boys required to till a field. But, if the book be used with discretion, these drawbacks will be lessened, and provided the student is taught in other ways to think about and really understand his subject, these exercises will serve to give him a facility in attacking numerical problems as they arise. The book should prove a useful aid to students and teachers of electrical engineering.

M. S.

Open-Air Studies in Bird Life; Sketches of British Birds in their Haunts. By C. Dixon. Pp. xii + 280; illustrated. (London: Griffin and Co., Ltd., 1903.) Price 7s. 6d.

MR. DIXON appears to consider that the appetite of the British public for books on the birds of their own islands is insatiable, and as he seems to find a publisher for all his works on this subject, he is perhaps justified in this opinion. In the present instance the subject is treated from a standpoint somewhat different from the one usually adopted, the birds being described in connection with their environment or "station," instead of systematically. Although this mode of treatment necessarily involves a certain amount of repetition (as in the case of the sparrow and the lapwing), it permits the descriptive side of the subject to be relegated somewhat to the background,

and greater prominence given to habits. So far, however, as we can see, the author appears to have recorded little or nothing new in regard to the latter, and we venture to think that he has missed an opportunity of giving fuller detail as to adaptation to environment, especially as regards coloration. Neither is he to be congratulated as regards his style in many parts of the work, as witness the following sentences in the description of the bearded tit (p. 184):—"The family characters are the same as the generic ones. It is found in various parts of Europe and Asia." It may be also pointed out that "Obb" (p. 261) is not the name of a well-known Siberian river. Again, the introduction of the word "Raptore" in connection with a cut on p. 84 is unnecessary and puzzling, when it is not, so far as we can see, used in the text. And this reminds us that a glossary of *eight* items seems strangely inadequate in a work where a considerable number of technical terms are necessarily employed, for we quite fail to see why it is necessary to explain the meaning of "aftershaft" and leave the reader to find out the signification of "primary."

As regards the illustrations, we have nothing but commendation to bestow, the full-page plates by Mr. Whympers—and especially the one of kingfishers—being exquisite delineations of bird-life. We notice, however, that the small text-figures of birds' heads are for the most part the well-known cuts of Swainson, which were used *with full acknowledgment* by Prof. Newton in his "Dictionary of Birds." Why, we may ask, has the author thought fit to depart from this excellent practice, and to publish the cuts in question as though they were original? R. L.

The Bermuda Islands. By A. E. Verrill, Yale University. (Published by the Author, New Haven, Conn., U.S.A., 1902.)

In this book, reprinted from the *Transactions* of the Connecticut Academy of Sciences, Prof. Verrill gives an account of the Bermuda group which is intended to subserve four distinct purposes; first, that of a general guide-book on the history, structure, and productions of the islands, for the use of visitors; second, of an introductory text-book to the study of the natural history of the archipelago; third, of a record of the more important changes in the flora and fauna already caused by man; and, lastly, that of a general introduction to a series of more technical memoirs, by the author and other naturalists, on the natural history and geology of the islands, now in course of publication. The present volume includes a general description of the islands, an account of their physical geography and meteorology, a sketch of their discovery and early history, and an account of the animals and plants introduced or exterminated since their discovery by the Spaniards about 1510. The last part of Prof. Verrill's work is of special value, for, so far as appears, no human being had set foot on the islands before that date. Accounts of the geology and marine zoology of the group are promised in a later volume. The book is illustrated by thirty-eight excellent plates, and a large number of cuts, and a valuable bibliography is appended.

La Pratique des Fermentations industrielles. By E. Ozard. Pp. 168. (Paris: Gauthier-Villars, n.d.) Price 2.50 francs.

This book is intended specially for the use of brewing chemists. The author gives the essential principles underlying the various fermentation processes, which allow of the transition of sugars and starches into alcoholic products, and also broadly indicates how those processes are carried out in practice.

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LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Psychophysical Interaction.

A BRIEF note to remove a possible misunderstanding suggested by Prof. Minchin. He seems to think, or to imagine that others will think, that when speaking of the action of mind on matter I conceive of mind as a thing that can sustain a "reaction"; so that a stress might exist with matter at one end and mind at the other. Such an absurdity would indeed play havoc with the laws of mechanics; at any rate, I never entertained such a notion for a moment, whether for a guiding or for any other kind of force. If I lift a table it is quite certain that the weight of the table, *plus* its mass-acceleration, is transmitted through my boots to the floor: so far mechanics is supreme. But not even Prof. Minchin could calculate whether I shall lift the table or not, nor what I shall do with it when I have lifted it. I should obey every law of mechanics if I cast it on a bonfire; but I should have interfered with the course of nature, regarded as a mechanically determinate problem, even by only lifting it.

I want to understand the nature of this interference better; I have no other "anxiety" on the subject.

Incidentally I should like to transfer to your pages a most interesting and clearly-worded claim made by Sir W. T. Thiselton-Dyer in to-day's *Times*:—

"Directive power... wipes out [meaning would wipe out if it were established]... the whole position won for us by Darwin. It is no use mincing matters. Students of the Darwinian theory must be permitted to know the strength and weakness of their dialectic position. What that theory did was to complete a mechanical theory of the Universe by including in it the organic world." It is the last sentence to which I would direct attention.

Athenæum Club, May 15.

OLIVER LODGE.

I AM not clear that it is wise to endeavour to aid Sir Oliver Lodge out of the pit he has, it seems to me, quite unnecessarily fallen into. But I will put a rope down to him, as it must be very uncomfortable down at the bottom.

Almost every mechanical problem leads by the application of ultimate mechanical principles to a differential equation. The solution of this equation involves a certain number of constants which may be infinitely many, but which we always find to be absolutely determined by the initial conditions. At first sight it seems difficult, without tacitly dropping a fundamental mechanical principle—such as that of momentum—to allow for "guidance" and "freewill" therein. But differential equations occasionally admit of *singular solutions*. We may follow up a particular solution, absolutely defined by the initial conditions, until we run onto the singular solution. After this we can stick to the singular solution or leave it again at any other contact with a particular solution, which will still satisfy the fundamental differential equation. Can "guidance" and free-will correspond to a shunt of this kind?

I am quite unaware of any differential equation in mechanics providing a good illustration of this suggestion. Still, we must get Sir Oliver up to the surface again, and this is the only rope by which I can conceive him ascending.

K. A. Π. V.

"Red Rain" and the Dust Storm of February 22.

THE Marquess Camden recently sent me a sample of fine sand or dust collected from the roof of Bayham Abbey, Lamberhurst, shortly after the great dust storm of February 22, which I have caused to be examined. As the results appear to be of interest, especially in reference to Mr. Clayton's contribution to the *Proceedings* of the Chemical